Environmental and Ecological Health Monitoring of Neonicotinoid Insecticides and multiple classes of fungicides originating from the AltEn Facility Mead, Nebraska

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Scope of Work and Project Background

In 2015, the AltEn, LLC ethanol plant (figure 1) located just south of Mead, Nebraska in Saunders County, began recycling pesticide treated seed corn as their feedstock. The plant produced and stored a significant amount of wastewater as well as distillers grain (wetcake) as part of the production process. Wastewater and wetcake were found to contain high levels of neonicotinoid insecticides and several classes of fungicides, including stobularin and azole compounds on the order of several thousand parts per billion of active ingredient. In 2017 and 2018, bee colonies kept on University of Nebraska-Lincoln property adjacent to the facility died and dust traps along with plant tissue samples were found to contain extremely high levels (>1,000 ng/g) of clothianidin and thiamethoxam.

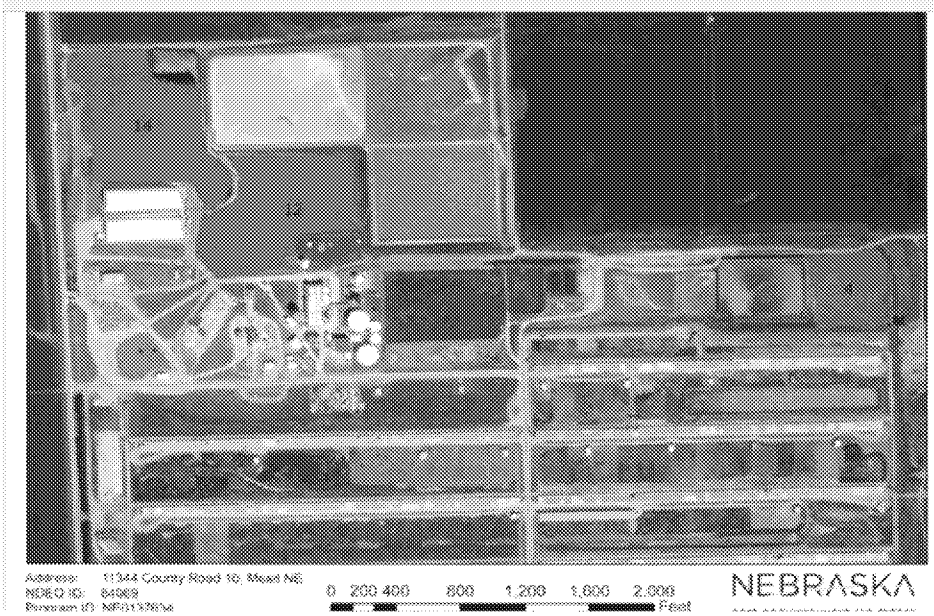

Figure 1. AltEn Bioenergy facility layout showing locations of wastewater lagoons, stockpiled distillers grains (wetcake) and adjacent cattle facility. Location is 1.5 miles south of Mead, Nebraska on County Road 10.

The extent of contamination is presently unknown, but likely covers an area of approximately 20-30 square miles based on waste product application records. Both the stockpiled wetcake and wastewater were annually land applied as recently as 2020. Records indicate that nearly 33,000 tons of wetcake were applied to cropland in 2018 with additional application occurring in 2019 and 2020, and an additional 84,000 tons are stored onsite. Approximately 176 million gallons of wastewater is stored onsite, however inspections show that the lagoon geomembrane liners are ruptured, and a recent inspection report notes continued receding water levels in the lagoons suggesting leakage offsite. Recent monitoring well testing indicates that thiamethoxam is detectable in the local groundwater. The plant ceased operations in February 2021 as requested by the Nebraska Department of Environment and Energy. A digester spill occurred in early February 2021, releasing additional wastewater and digestate to

the surrounding environment, including a 9663-acre University of Nebraska research facility that occupies a former Department of Defense ordnance production facility.

The purpose of this project is to evaluate the on-site and on-off site occurrence and transport of neonicotinoid insecticides, fungicides and biologically-relevant degradation products originating from the stockpiled wet cake, land applied wet cake, and wastewater as well as potential human, animal, and ecosystem health impacts. Environmental media to be sampled include soil, surface water, groundwater, dust, air and vegetation sampling. The environmental health effects of exposure will be evaluated in aquatic invertebrates, bees, amphibians, and birds. Exposure to surrounding residents of the area are planned in a parallel project.

Project Objectives

1. Compile available background information on site characteristics and ambient contamination levels prior to 2015.
2. Quantify the baseline concentrations of neonicotinoid insecticides and fungicides and their transformation products on and off site in water, soil, air and dust immediately after closure of the AltEn facility.
3. Determine the transport of neonicotinoid insecticides and fungicides and their transformation products from the wastewater lagoons, stockpiled wetcake piles or land applied wet cake vertically into the soil profile to determine potential impacts to groundwater.
4. Determine the transport of neonicotinoid insecticides and fungicides and their transformation products to surface water and surface soils from stockpiled wetcake piles in runoff during precipitation events
5. Evaluate the potential for airborne contaminants to cause adverse human health.
6. Evaluate direct and indirect health impacts on local insect, amphibian, and bird communities.

Sampling Plan – Environmental Samples

The UNL team is currently monitoring surface water at 7 locations in the area with both grab and passive samplers. We anticipate adding soil and groundwater sampling by the end of June 2021. We will collect both surface soils as well as cores to a depth of 50 feet to evaluate vertical migration of contaminants. Access to the AltEn facility is limited, so we are currently focusing on sampling in areas affected by the February 2021 spill, as well as areas where wetcake and wastewater were land applied. We are also working with the manager of a cattle feedlot located adjacent to the AltEn property to sample next to the AltEn facility. There are approximately 6200 people that live in the communities of Mead, Wahoo, Yutan and Ithaca. There are an additional 500-1000 rural residents living in areas where the waste products were land applied. For human exposure, a team from the University of Nebraska Medical Center (UNMC) College of Public Health is developing a CASPER-like assessment which will be deployed in the affected communities shortly. The UNMC group are also planning biological sample collections, primarily blood and urine.